

DIVISION 2: PHYSICAL MEASUREMENT OF LIGHT AND RADIATION

QUADRENNIAL REPORT 1999 – 2003

Teresa Goodman

1. TERMS OF REFERENCE

- To study standard procedures for the evaluation of UV, visible and IR radiation, global radiation and optical properties of materials and luminaires.
- To study optical properties and performance of physical detectors and other devices required for this evaluation.

2. ADMINISTRATIVE MATTERS

Teresa Goodman (UK) was appointed for a first term as Division Director by the CIE Board at the 1999 CIE Session in Warsaw, taking over from the previous Division Director, Franz Hengstberger. She appointed three Associate Directors, two of whom had also served under the previous Division Director. The Associate Directors' responsibilities were divided approximately as follows:

- Sources and detectors – Georg Sauter (DE)
- Materials – Norbert Johnson (US)
- Luminaires – Guy Vandermeersch (BE)

Yoshi Ohno was re-appointed as Division Secretary and John Moore as Division Editor.

The following new Technical Committees commenced work during the quadrennium:

- TC2-50 *Measurement of the optical properties of LED clusters and arrays* (chair: G Sauter, DE)
- TC2-51 *Calibration of multi-channel spectrometers* (chair: R Austin, US)
- TC2-52 *Photometry of Emergency Lighting Luminaires* (chair: G Vandermeersch, BE)
- TC2-53 *Multi-Geometry Color Measurements of Effect Materials* (chair: G Rösler, DE)
- TC2-54 *Review of IEC documents for colour measurement and management in multimedia systems* (chair: J Schanda, HU)
- TC2-55 *Round Robin Investigation of Implementation of CIE Photobiological Safety Standard* (chair: K Kohmoto, JP)

The following Technical Committees were dissolved during the quadrennium:

- TC2-04 *Secondary standard sources* (chair: J Moore, UK)
- TC2-14 *Measurement of Reflectance and Transmittance, Including Turbid Media* (chair: P Polato, IT)
- TC2-30 *Array radiometry* (chair: J Palmer, US)
- TC2-36 *Revision of CIE publication 54: retroreflection* (J Rennilson, US)
- TC2-41 *Industrial photometry in developing countries* (B Bhattacharya, IN)
- TC2-54 *Review of IEC documents for colour measurement and management in multimedia systems* (chair: J Schanda, HU)

There were changes in the chairpersons for the following Technical Committees:

- TC2-17 *Recommendation for integrated irradiance and spectral distribution of simulated solar radiation* (previous D Kockott, DE; new G Zerlaut, US)
- TC2-28 *Methods of characterizing spectrophotometers* (previous J Verrill, UK; new P Clarke, UK)

TC2-29 *Measurement of detector linearity* (previous T Goodman, UK; new T Larason, US)

TC2-42 *The Colorimetry of Visual Displays* (previous A Hanson, UK; new C Wall, UK)

New reporterships were established in the following areas:

R2-23 *ISO/CIE Standards for the measurement of reflectance and transmittance* (D Rich, USA)

R2-24* *Classification of colour measuring instruments* (Y Ohno, USA)

R2-25* *Liaison with IALA* (I Tutt, UK)

R2-26* *Eye safety of light emitting diodes* (T Goodman, UK)

R2-27 *Field measurement for traffic signals* (C Anderson, US)

R2-28 *Evaluation of colorimeter spectral responsivity* (B Kránicz, HU)

R2-29 *Characterization of imaging luminance measurement devices* (P Blattner, CH)

R2-30 *Problems linked to correct measurement of TL5 fluorescent lamps with existing electronic ballast* (G Vandermeersch, BE)

R2-31 *Problems with spectroradiometric measurement of light sources associated with bandpass and sampling intervals* (D Gibbs, UK)

Those marked * completed their work during the quadrennium. The following reporterships were also dissolved following completion of their work:

R2-06 *Standardisation of measuring geometry for the colorimetry of metallic coatings* (C McCamy, US)

R2-09 *Absolute cryogenic radiometers* (A Parr, US)

R2-17 *Aviation Photometry* (Y Ohno, US)

R2-22 *Implementation of photometric units* (R Köhler, BIPM)

3. MEETINGS

In order to maximise attendance at Division meetings, and encourage participation by new contributors, these were scheduled to precede or follow other major symposia or conferences in optical radiation metrology, and were held in conjunction with other Divisions (notably Division 1) where this was practicable. The following Division meetings were held:

- 30 June 1999, Warsaw (Poland), during the 24th quadrennial session.
- 8 April 2000, NPL, London (UK), in conjunction with the *Colour 2000* conference and also linked with meetings of Divisions 1 and 8. A joint meeting with also held with Division 1 on 6 April 2000, to discuss matters of common concern.
- 18-19 May 2001, NIST, Gaithersburg (USA), in conjunction with the *Second CIE Expert Symposium on LED Measurements*.
- 27-28 August 2002, Veszprem (Hungary), in conjunction with the *CIE Symposium on Temporal and Spatial Aspects of Light and Colour Perception* and also linked with a meeting of Division 1. A joint meeting was also held with Division 1 on 26 August 2002, to discuss matters of common concern.

A number of Technical Committees met in conjunction with each of the Division meetings; details are given in the minutes for the Division meetings.

4. SYMPOSIA

Division 2 organised the following CIE Symposia / Conferences:

- *Colour 2000* conference, April 2000, UK (organised jointly with Divisions 1 and 8). This was divided into two conference sessions - *Colour and Visual Scales 2000* in London on 3-5 April and *Colour Image Science 2000* in Derby on 10-12 April. The conference was very successful, attracting almost 100 delegates from all around the world, including Europe, USA, Japan, Australia, South Africa and Russia. Papers included a range of topics, including mesopic photometry, colour appearance, brightness matching and colour difference evaluation.
- *Uncertainty Evaluation for Optical Radiation Measurements*, January 2001, CIE Central Bureau. Over 60 delegates were present (in fact the meeting was over-subscribed), representing all areas of optical radiation measurement from manufacturers of lamps and luminaires through to national metrology institutes. The symposium covered a very wide range of topics, including a basic introduction to uncertainties, the use of a 'measurement equation' in the evaluation of measurement uncertainty, effects of correlation, procedures for spectrally weighted quantities and the assessment of photometric uncertainties in industry.
- *Second Expert Symposium on LED Measurements*, May 2001, NIST, USA. Over 90 delegates were present (the meeting was over-subscribed), representing all areas of optical radiation measurement from manufacturers of LEDs through to national metrology institutes. The symposium covered a very wide range of topics, including basic principles of photometric, spectroradiometric and colorimetric measurements, evaluation of uncertainties, new developments in LED technology and applications (e.g. traffic signalling) and measurement instrumentation.
- *Temporal and Spatial Aspects of Light and Colour Perception and Measurement*, August 2002, Veszprem, Hungary (organised jointly with Division 1). This brought together about 50 experts in the fields of vision, measurement, signalling and imaging, to discuss issues relating to the perception and measurement of light sources and images whose properties vary with time or space (e.g. flashing beacons used as aids to navigation at sea and test prints used to check the quality of scanners and printers). The presentations covered a wide range of topics, including the visibility of a flash of light, the detection of a moving target in road traffic simulation studies, contrast sensitivity functions, and changes in the performance of the eye as a function of illumination level and age.

5. TECHNICAL REPORTS AND PUBLICATIONS

The following CIE Technical Reports were published:

CIE 54.2-2001 *Retroreflection: definition and measurement*

CIE 135/6-1999 *45°/0° spectral reflectance factors of pressed polytetrafluoroethylene (PTFE) powder* in CIE 135-1999 *CIE Collection in vision and colour and in physical measurement of light and radiation, 1999*

CIE 149-2002 *The use of tungsten filament lamps as secondary standard sources*

The following CIE Draft Standards were published:

CIE DS010.3-2003 *Photometry - The CIE system of physical photometry*

The following Proceedings were published

CIE x020-2001 *Proceedings of the CIE Symposium 2001 " Uncertainty Evaluation - Methods for Analysis of Uncertainties in Optical Radiation Measurement "*

CIE x022-2001 *Proceedings of the 2nd CIE Expert Symposium on LED Measurement "Standard Methods for Specifying and Measuring LED and LED Cluster Characteristics" (2001)*

CIE x025-2003 *Proceedings of the CIE Symposium '02 on Temporal and Spatial Aspects of Light and Colour Perception and Measurement, August 2002*

6. LIAISONS

Liaisons were maintained as follows (those marked * were closed during the quadrennium and those marked + are new liaisons established during the quadrennium):

Comité Consultatif de Photométrie et Radiométrie – CCPR, R Köhler (BIPM) and M Stock (BIPM)

Division 8+, Y Ohno (US) and A Kravetz (US)

International Association of Lighthouse Authorities – IALA+, C Andersen (US)

International Dark Sky Association – IDA+, J Rennilson (US)

IEC TC34 Lamps and related equipment, G Vandermeersch (BE)

IEC TC100 Audio, video and multimedia systems, Y Ohno (US) and J Schanda (HU)

*IEC/ISO JTAG2 Joint technical advisory group 2**, Y Ohno (US)

ISO TC6/WG3 Paper, board & pulps – optical properties, J Zwinkels (CA)

*ISO TC160 SC2 WG2 Glass in buildings, light and energy transfer**, J Hsia (US)

*ISO TC 180/SC 1: Solar energy/Climate - Measurement and data** D Kockott (DE)

ISO on reflectance and transmittance issues+, D Rich (US)

OIML, G Sauter (DE)

7. TECHNICAL COMMITTEE WORK IN PROGRESS

TC	STATUS
2-04 <i>Secondary Standard Sources</i> (J Moore, UK)	The report has been published as CIE 149-2002.
2-16 <i>Characterisation of the Performance of Tristimulus Colorimeters</i> (M Rastello, IT)	Document is nearly complete. At the last meeting in 2001, comments on the 6th draft were received and an editorial board was formed within the TC to prepare the final version for TC ballot. The TCC hopes to finish the document at the San Diego meeting.
2-17 <i>Recommendation for Integrated Irradiance and Spectral Distribution of Simulated Solar Radiation</i> (previously D Kockott, DE, now G Zerlaut, US)	The TC was not active for several years, due to retirement of the chairman from his place of work. Following the 2002 Division meeting, a new chairman was appointed and is now contacting members and reviewing the previous drafts.
2-19 <i>Measurement of the Spectral Coefficient of Retroreflection</i> (N Johnson, US)	The intercomparison of the spectral coefficient of retroreflection is complete and the report now needs only final editing. The report will be sent to the Editor as soon as possible and is expected to be sent for TC ballot shortly.
2-23 <i>Photometry of Street-Lighting Luminaires</i> (G Vandermeersch, BE)	The planned document is to provide industrial laboratories with the information they need in order to carry out the photometric measurements of street-lighting luminaires required in documents published by D4. CIE 140 already addresses many issues related to measurement. The TCC needs an exchange of ideas with TC members regarding what needs to be added in relation to street-lighting luminaires. A meeting will be held during the quadrennial session in San Diego.
2-24 <i>Users Guide for the Selection of Illuminance</i>	The draft has been completed but there are some cosine response problems to discuss. The TCC plans to have a virtual meeting to

<i>and Luminance Meters</i> (K Ganesha, IN)	distribute the draft, but this has not yet taken place.
<i>2-25 Calibration Methods and Photoluminescent Standard for Total Radiance Factor Measurement</i> (J Zwinkels, CA)	The TC last met in May 2001 in Gaithersburg, MD in conjunction with the CORM annual meeting. The ninth draft of the TC report was discussed. Input was received on: properties and availability of additional fluorescent material standards, additional details of NPL spectrofluorimeter, and editorial changes to list of references. There was considerable discussion regarding terminology and notation; in particular, the need to consistently distinguish between fixed and variable measurement parameters. It was proposed to include an Appendix in this TC report, containing a cross-reference of notation in current use for quantities relevant to fluorescence measurements. This proposal was circulated to TC members for comment and approved. This stimulated the TCC to carefully review the document to ensure that notation was clearly defined and consistently implemented. These revisions have been made by the TCC and the document (tenth draft) is currently undergoing final review before being circulated for TC ballot. This work should be completed before the next TC meeting, to be held during the quadrennial session in San Diego.
<i>2-28 Methods of Characterising Spectrophotometers</i> (previously J Verrill, UK, now P Clarke, UK)	Progress has been slow since the death of the previous chairman, J Verrill. However, the document is at an advanced stage, and it is mainly editorial issues that now need to be finalised. It is hoped that a draft for TC ballot will be available around the time of the San Diego meeting.
<i>2-29 Measurement of Detector Linearity</i> (previously T Goodman, UK, now T Larason, US)	The draft is at a fairly advanced stage but needs more work before it can be regarded as ready for ballot. A new chairperson was appointed at the 2002 Division meeting. He is now reviewing the previous work and contacting TC members ready for a TC meeting during the quadrennial session in San Diego.
<i>2-30 Array Radiometry</i> (J Palmer, US)	The Chairmanship changed to Palmer in 1998 but no progress has been reported since then. A large number of abstracts have been collected, but there was an issue of copyright for abstracts collected in the former chairman's company and a concern that the information might already be outdated. It was proposed at the 2001 Division meeting that the abstracts should be passed to TC2-51 for consideration during the work of this TC, and this was subsequently agreed with the 2 relevant TCCs. TC2-30 was therefore closed at the 2002 Division meeting.
<i>2-32 Measuring Retroreflectance of Wet Horizontal Road Markings</i> (N Hodson, US)	This TC has been very active during the past few years, holding regular meetings to discuss the draft documents. The work is being closely coordinated with Division 4. A meeting is to be held during the quadrennial session in San Diego.
<i>2-35 CIE Standard for $V(\lambda)$ and $V'(\lambda)$</i> (K Mielenz, US)	The document has been published as a draft CIE standard, DS010.3-2003 Photometry - The CIE system of physical photometry. Several comments were made during the ballot, most of which were editorial and have now been resolved. However one more significant technical comment was made, regarding the definition of radiance and luminance (i.e. whether to use $d\lambda/\dots$, $d^2\lambda/\dots$, or some other formalism), which generated much discussion within the Division. It has been agreed that the present ILV definition should be used and the question of whether a

	change to the definition is required has been referred to TC 2-44.
2-36 <i>Revision of CIE Publication 54: Retroreflection</i> (J Rennilson, US)	The report has been published as CIE 54.2-2001 <i>Retroreflection: Definition and Measurement</i> and the TC was consequently closed at the 2002 Division meeting. The need for a follow on TC, to convert the report to a CIE/ISO standard has been discussed and agreed.
2-37 <i>Photometry Using Detectors as Transfer Standards</i> (Y Ohno, US)	Work is nearly complete. The sixth draft was distributed in April 2002 by email, and only a few minor comments were received. The next draft is for TC ballot, and needs only minor changes and updates to some figures and the format of document. The final version for TC ballot is expected to be ready around the time of the quadrennial session in San Diego.
2-39 <i>Geometric Tolerances for Colorimetry</i> (D Rich, US)	A fourth draft was circulated in June 2002. A meeting is to be held during the quadrennial session in San Diego to discuss the comments received.
2-40 <i>Characterising the Performance of Illuminance and Luminance Meters</i> (R Rattunde, DE)	No report has been received since the 2001 Division meeting. At that time the chairman reported that he was working on the next draft and was planning to use the e-mail reflector to discuss this on-line, before holding the next physical meeting.
2-41 <i>Industrial Photometry in Developing Countries</i> (B Bhattacharya, IN)	This TC was inactive for many years and was therefore closed at the 1999 Division meeting.
2-42 <i>Colorimetric Measurements for Visual Displays</i> (previously A Hanson, UK, now C Wall, UK)	The TC met in May 2001 but there has been little progress since then. During this meeting the 2nd draft was discussed and several major revisions to the document were agreed, including a complete review of chapters 4 and 5 to reduce duplication.
2-43 <i>Determination of Measurement Uncertainties in Photometry</i> (G Sauter, DE)	The TC met in May 2001 but there has been little progress since then. A draft document has been produced, which is split into two main parts. The first part, on the fundamentals of uncertainty evaluation, is complete but requires editing. The second part contains practical examples and the TCC has made a request for more of these. A meeting is to be held during the quadrennial session in San Diego.
2-44 <i>Vocabulary Matters</i> (J Moore, UK)	The Division 2 part of the Vocabulary (proposed changes) went through Division ballot in June 2002. One objection, which was also raised with the TC2-35 document (DS10.2e), was that the ILV definition of radiance and luminance may be incorrect – this is now under review. Another request was to define the CIE standard spectral luminous efficiency function in the ILV, but it was decided during the 2002 Division meeting that this was probably unnecessary.
2-45 <i>Measurement of LEDs - Revision of CIE 127</i> (K Muray, US)	This TC has been progressing its work via e-mail discussions using the e-mail reflector. In particular, the use of f1-LED to evaluate the V(λ) match of photometer heads has been debated, but no conclusion has yet been reached. The need for an intercomparison of spectral measurements on LEDs is also under discussion. A request has been received from Division 6 that the document should include recommendations on the measurement of radiance for bare chips and encapsulated LEDs, in order to meet the requirements of the CIE publication on the photobiological safety of light sources, and this has

	been added to the work programme. A meeting is to be held during the quadrennial session in San Diego.
2-46 <i>CIE/ISO Standards on LED Intensity Measurements</i> (J Scarangelo, US)	Work has been progressing via e-mail discussions. A meeting is to be held during the quadrennial session in San Diego.
2-47 <i>Characterisation and Calibration Methods of UV Radiometers</i> (G Xu, Singapore)	There is a high level of interest in the work of this TC from industrial and measurement laboratories. A draft has been prepared, based closely on CIE publication 69, and this is being discussed. Members of the TC are being encouraged to send their calibration procedures to the chairman, for consideration for inclusion in the document. A new draft has recently been prepared and work is continuing via the e-mail reflector.
2-48 <i>Spectral Responsivity Measurement of Detectors, Radiometers, and Photometers</i> (G Eppeldauer, US)	The TC met in August 2002 to discuss the fourth draft. The scope of the report is to cover spectral responsivity in radiant power, irradiance, and radiance mode, in the 200 nm to 2.5 μ m spectral region. Four chapters have been written, including chapter 3 on radiant power responsivity and chapter 4 on irradiance responsivity. Work on Chapter 5 (radiance responsivity) is to start shortly. Several suggestions were made at the meeting, and the next version of the draft document is to be prepared for a TC meeting during the quadrennial session in San Diego.
2-49 <i>Photometry of Flashing Light</i> (Y Ohno, US)	A meeting was held in August 2002, during which the second draft was distributed and discussed. Section 4 (Effective Intensity), which described only the Form Factor method in the previous draft, has now been rewritten to include the three methods currently used, as a temporary treatment until a consensus can be reached for one best (recommended) method. There were considerable discussions on the validity of the various methods proposed and the consensus was that visual experiments are needed to evaluate the methods, particularly for trains of pulses and other specific pulses. The TCC agreed to form a Working Group comprising experts from D1 and D2 to formulate the experimental conditions of the required visual experiments and publicise a call for research. Related documents will be posted on the website. This work is being coordinated with Division 1.
2-50 <i>Measurement of the Optical Properties of LED Clusters and Arrays</i> (G Sauter, DE)	This TC was established at the 1999 Division meeting and the first (informal) meeting was held in May 2001. There is a high level of interest in this topic, particularly from area of signalling. The first official meeting is to be held during the quadrennial session in San Diego.
2-51 <i>Calibration of Multi-channel Spectrometers</i> (R Austin, US)	This TC was established at the 1999 Division meeting and last met in May 2001. There has been little progress since then, but a meeting is to be held during the quadrennial session in San Diego.
2-52 <i>Addendum to CIE 121 for the Photometry of Emergency Lighting Luminaires</i> (G Vandermeersch, BE)	This TC was established at the 2000 Division meeting and has met several times since then. The work of the TC is being closely coordinated with that of Division 5, IEC and CEN. A meeting is to be held during the quadrennial session in San Diego.
2-53 <i>Multi-Geometry Colour Measurements of Effect Materials</i> (G Rösler,	This TC was established at the 2001 Division meeting and met for the first time in August 2002. This first meeting was a brainstorming session to consider what should be done by the TC, and what specific

DE)	inputs are needed for the report. There was an agreement to start with a review of existing standards and protocols for measurements on metallic paints and pigments and effect materials, possibly including a measurement comparison. The report will begin with an educational part and then measurement recommendations, including measurement geometry. The recommendations from TC2-39 will be used as the basis for any recommendations on measurement geometry. The TC will look at DIN and ASTM standards to investigate the classical description of geometric tolerances.
2-54 <i>Review of IEC Documents for Colour Measurement and Management in Multimedia Systems</i> (J Schanda, HU)	This TC was established during the 2001 Division meeting to provide a mechanism for a more coordinated review of IEC draft documents. However the volume of draft reports declined markedly during 2001 and it was decided at the 2002 meeting to close the TC and establish a reportership instead.
2-55 <i>Round Robin Investigation of Implementation of CIE Photobiological Safety Standard</i> (K Kohmoto, JP)	This TC was established during the 2002 Division meeting with the following terms of reference: To conduct a measurement intercomparison in order to investigate potential systematic errors in the interpretation of the measurement procedures laid down in the CIE photobiological safety of lamp standard (CIE S009), and determine whether improvements are required to the specified procedures. The output will be a technical report describing the intercomparison, the results, and recommendations for improvements to the measurement procedures in CIE S009. No progress so far.

8. REPORTERSHIPS IN PROGRESS

TITLE	STATUS
2-05 <i>Visual Gloss</i> (Previously J Taylor, UK, now M Pointer, UK)	Work is underway in several countries on the measurement of 'appearance' and a watching brief is being kept to see whether a Technical Committee on this subject should be established.
2-06 <i>Standardisation of Measuring Geometry for the Colorimetry of Metallic Coatings</i> (C McCamy, US)	This reportership was closed at the 2002 Division meeting, following the establishment of TC2-53 <i>Multi-Geometry Colour Measurements of Effect Materials</i> .
2-09 <i>Absolute Cryogenic Radiometers</i> (A Parr, US)	This reportership was closed at the 1999 Division meeting, at the reporter's recommendation (it was agreed that since the use of cryogenic radiometers is, and will continue to be, limited to national metrology institutes, a CIE technical report on their use was not necessary or appropriate).
2-18 <i>OIML Matters</i> (G Sauter, DE)	This reportership was closed at the 2001 Division meeting, and transferred to a liaison activity.
2-21 <i>Use of Detectors as Absolute Transfer Standards for Spectroradiometry</i> (N Fox, UK)	This follows TC2-37, which is looking at photometers as absolute standards. This reportership is to investigate the potential for taking the next step, which is to use detectors as absolute standards for spectroradiometry, e.g., to use diode-array instruments or tuneable-filter systems. There are a lot of developments, but nothing is yet reliable enough to be generally recommended. This reportership is to be kept

	open and will continue to monitor the situation.
2-22 <i>Implementation of Photometric Units</i> (R Kohler, BIPM)	This reportership was closed at the 2000 Division meeting, on the recommendation of the reporter.
2-23 <i>ISO/CIE Standards for the measurement of reflectance and Transmittance</i> (D Rich, US)	This reportership was established during the 1999 Division meeting, to consider the need to convert parts of CIE 130 into CIE/ISO standard(s). This is still under consideration.
2-24 <i>Classification of colour measuring instruments</i> (Y Ohno, US)	This reportership was established during the 1999 Division meeting to consider a request from Division 8 for recommendations on methods for classification of colour measuring instruments (used for visual displays) in terms of accuracy. The reporter investigated methods including those using f_l' (CIE 69), average ΔE (CIE 13.3), and metamerism index, but is not convinced that any of these have yet been shown to be suitable for recommendation for classification purposes. However, there no longer seems to be a strong demand from Division 8 for a classification system for colorimeters, and it was therefore agreed at the 2002 Division meeting that the reportership should be closed and that the need for further work should be considered under the Division 8 liaison function.
2-25 <i>Liaison with IALA</i> (I Tutt, UK)	This reportership was established during the 1999 Division meeting and transferred to a liaison function at the 2002 Division meeting.
2-26 <i>Eye safety of Light Emitting Diodes</i> (T Goodman, UK)	This reportership was set up in 2001 following on from the LED Symposium. Following a discussion between the Directors of Divisions 2 and 6, a new TC (6-55) on Photobiological Safety of LEDs was established in D6 to consider criteria and recommendations for assessment of the safety of LEDs. In addition, it was agreed that TC2-45 should be asked to include a section on measurement of the radiance of LEDs, and this has now been added to the planned work for this TC. Therefore, the work of the reportership has been completed and it was closed during the 2002 Division meeting.
2-27 <i>Field Measurement for Traffic Signals</i> (C Anderson, US)	This reportership was set up in 2001 following on from the LED Symposium. The reporter has begun an investigation of existing equipment used for field measurement of traffic signals, as used in the US, and intends to verify the performance of some of these devices for LED traffic signals. It was agreed at the 2002 Division meeting that this study would be extended to outside the US.
2-28 <i>Evaluation of Colorimeter Spectral Responsivity</i> (B Kranicz, HU)	This reportership was set up in 2001 following on from the LED Symposium, to review new methods for assessing the 'quality-of-fit' of the spectral responsivity of colorimeters, particularly for use with new sources such as LEDs. A report is to be prepared for the quadrennial meeting in San Diego.
2-29 <i>Characterization of Imaging Luminance Measurement Devices</i> (P Blattner, CH)	This was set up during the Division meeting in 2002, to prepare a proposal for a new TC to prepare recommendations on the characterisation and calibration of CCD-based imaging photometers, having input from D4 and D8 on the needs from the application side.
2-30 <i>Problems Linked to Correct Measurement of TL5 Fluorescent Lamps with Existing Electronic</i>	This reportership was established during the Division meeting in 2002 to consider the need for recommendations on the correct measurement of TL5 fluorescent lamps.

<i>Ballasts</i> (G Vandermeersch, BE)	
2-31 <i>Problems with the Spectroradiometric Measurement of Light Sources, Particularly those Associated with Bandpass and Sampling Interval.</i> (D Gibbs, UK)	This reportship was established during the Division meeting in 2002 to consider the need for a revision of CIE 63 (1984) and make a recommendation regarding whether a separate document is necessary to deal specifically with issues relating to band pass and sampling intervals, including the effects on colour calculations.

9. DIVISION WEBSITE AND COMMUNICATIONS

During the quadrennium significant improvements have been made to the website, to improve its ease of use and versatility. All current Division activity reports, meeting minutes, membership lists, contact details and circulars are available on the website, and there is an excellent archive of past meeting reports, minutes and activity reports. Many of the draft documents are available to TC members from the website (these are password protected) and e-mail reflectors have been set up to encourage rapid exchange of ideas and to encourage debate; these have been very successful and are being increasingly widely used. The website is hosted on the web server of the National Institute of Standards and Technology (NIST) in Gaithersburg, US, at <http://cie2.nist.gov>. Most communication with Division members is via e-mail and this has helped to ensure that information is distributed quickly and effectively.

10. ACKNOWLEDGEMENTS

The high quality of the communications with Division members and the website development are mainly due to the commitment and hard work of the Division Secretary, Dr Yoshi Ohno, and on behalf of myself and the Division, I record our thanks and appreciation for his excellent work. I also thank the Associate Directors (Norbert Johnson, Georg Sauter and Guy Vandermeersch) for their hard work over the quadrennium, and commend the Division Editor for the excellent work he has done to maintain the high standard of the technical reports produced by the Division.

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